

## **LOCKING MECHANISM**

### **INVENTORS:**

**Sung-Woong Ahn**

**Yun-Taek Jung**

### **CROSS-REFERENCE TO RELATED APPLICATIONS**

[0001] Pursuant to 35 U.S.C. § 119(a), this application claims the benefit of earlier filing date and right of priority to Korean Patent Application Nos. 10-2003-0018526 and 10-2003-0018528, each one filed on March 25, 2003, the contents of which are hereby incorporated by reference in their entirety.

### **BACKGROUND OF THE INVENTION**

#### Field of the Invention

[0002] The present invention relates generally to locking devices and more particularly to a locking mechanism for a mobile telephone battery cover.

#### Description of the Related Art

[0003] Figure 1 schematically illustrates a conventional locking mechanism 230 for a battery cover 220 being provided within a main body 100 of a mobile telephone set. Locking mechanism 230 is provided with a protective

cover 240, which is coupled to main body 100.

[0004] Figures 2 – 3 schematically illustrate the various parts of conventional locking mechanism 230. Specifically, locking mechanism 230 includes a locking member 231 being movably coupled to a shaft support portion 201 formed in main body 100 via a shaft 231a and a spring 232. Spring 232 is mounted between locking member 231 and main body 100 and adapted to elastically support locking member 231. Locking member 231 includes a lock portion 231b adapted to engage a latching portion 220a of battery cover 220 for the purpose of locking battery cover 220 to main body 100.

[0005] Battery cover 220 may be unlocked from main body 100 by the user pressing on locking member 231 so as to disengage lock portion 231b from latching portion 220a. This type of locking arrangement is unfortunately not foolproof as an external impact such as from dropping the mobile telephone on the ground may result in spring 232 being accidentally compressed enough to allow the release of lock portion 231b from latching portion 220a of battery cover 220.

### **SUMMARY OF THE INVENTION**

[0006] In accordance with one aspect of the present invention, a locking mechanism comprises at least one latching member and at least one spring loaded locking member adapted to securely engage the latching member at one end when the latching member is fully inserted in at least one spacing provided at that end. The latching member forces the spring loaded locking member to move against its spring bias when the latching member is being

inserted in the spacing with the spring loaded locking member having moved under its spring bias when the latching member is fully inserted in the spacing.

[0007] The locking mechanism also comprises means for moving the spring loaded locking member against its spring bias to allow the fully inserted latching member to disengage from the spring loaded locking member.

[0008] These and other aspects of the present invention will become apparent from a review of the accompanying drawings and the following detailed description of the present invention.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

[0009] The present invention is generally shown by way of reference to the accompanying drawings as follows.

[0010] Fig. 1 schematically illustrates a conventional locking mechanism for a battery cover of a mobile telephone set.

[0011] Fig. 2 schematically illustrates the general composition of the conventional locking mechanism of Fig. 1.

[0012] Fig. 3 further illustrates the composition of the conventional locking mechanism of Fig. 1.

[0013] Fig. 4 schematically illustrates a locking mechanism in accordance with one embodiment of the present invention.

[0014] Figs. 5A and 5B schematically depict the locking of a battery cover to the main body of a mobile telephone set utilizing the locking mechanism of Fig. 4.

[0015] Figs. 6A and 6B schematically depict the unlocking of a battery cover from the main body of a mobile telephone set utilizing the locking mechanism of Fig. 4.

[0016] Fig. 7 schematically illustrates an alternative locking mechanism in accordance with another embodiment of the present invention.

[0017] Fig. 8 schematically illustrates the general exterior of a mobile telephone set in accordance with the embodiment shown in reference to Fig. 7.

[0018] Figs. 9A and 9B schematically depict the locking of a battery cover to the main body of a mobile telephone set utilizing the locking mechanism of Fig. 7.

[0019] Figs. 10A and 10B schematically depict the unlocking of a battery cover from the main body of a mobile telephone set utilizing the locking mechanism of Fig. 7.

#### **DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS**

[0020] Some embodiments of the present invention will be described in detail with reference to the related drawings of Figures 1 – 10B. Additional embodiments, features and/or advantages of the invention will become apparent from the ensuing description or may be learned by practicing the invention.

[0021] In the figures, the drawings are not to scale with like numerals referring to like features throughout both the drawings and the description.

[0022] The following description includes the best mode presently

contemplated for carrying out the invention. This description is not to be taken in a limiting sense, but is made merely for the purpose of describing the general principles of the invention.

[0023] Figure 4 schematically illustrates a locking mechanism in accordance with a preferred embodiment of the present invention. The locking mechanism may be used to securely lock a battery cover to the main body of a mobile telephone set, as generally shown in reference to Fig. 4. The battery cover locking mechanism of Fig. 4 preferably comprises a pair of oppositely disposed generally hook-shaped latching members 21 formed on a battery cover 20, and a pair of locking members 50 movably disposed opposite each other within a main body 10 of a mobile telephone set and adapted to engage latching members 21 to secure battery cover 20 to main body 10. The battery cover locking mechanism also comprises a pair of knobs 40, each one extending integrally from a corresponding locking member 50 and to which an external force may be applied for moving linearly locking members 50, and a pair of oppositely disposed elastic members 30, each one operatively coupled between a corresponding locking member 50 and a support member 12 which is formed in the middle of a groove 11, as generally shown in Fig. 4. Groove 11 is disposed in main body 10 and used to guide the linear movement of locking members 50. Support member 12 is used to support elastic members 30.

[0024] Each locking member (50) includes a pair of generally oppositely disposed first and second locking legs 51, 52 adapted to form an insertion space 53 for latching member 21. First and second locking legs 51, 52

are preferably adapted to engage a corresponding latching member 21 within its respective insertion space 53 to securely lock battery cover 20 to main body 10. Specifically, an inner surface 51a of first locking leg 51 is adapted to engage a corresponding inner surface 21a of latching member 21 to catch the same within insertion space 53, as generally illustrated in Fig. 4.

[0025] Second locking leg 52 includes an inner surface 52a, which is inclined at a predetermined angle so as to generally match the curvature of a corresponding outer surface 21b of latching member 21. When latching member 21 is in the process of being released from the grip of first and second locking legs 51, 52, second locking leg 52 pushes latching member 21 out of insertion space 53 whereby the width of inclined inner surface 52a is related to the pushing force on latching member 21. In general, the bigger the width of inner surface 52a, the greater the force with which latching member 21 is being pushed. Outer surface 21b of latching member 21 is adapted to allow latching member 21 generally smooth entry into insertion space 53 with outer surface 21b pushing against inner surface 52a of second locking leg 52 when battery cover 20 is being locked to main body 10.

[0026] Each elastic member 30 may be in the form of a spring coupled between a corresponding locking member 50 and support member 12 with the springs disposed opposite each other and each spring being biased toward a corresponding latching member (21). Alternatively, a single elastic member 30 may include a spring operatively coupled between locking members 50 and being biased at each end toward a corresponding latching member (21).

Yet another alternative may include a spring coupled between each locking member 50 and main body 10 with the springs disposed opposite each other and each spring being biased toward a corresponding latching member (21). A person skilled in the art would readily recognize that various other ways and configurations may be utilized to spring load locking members 50 in the manner described hereinabove.

[0027] Knobs 40 protrude from locking members 50 to provide gripping surface for the user. The user moves locking members 50 toward/away from each other by way of integral knobs 40, respectively.

[0028] The process of locking battery cover 20 to main telephone body 10 is generally depicted in reference to Figs. 5A – 5B. Specifically, as each latching member (21) of battery cover 20 gradually enters its respective insertion space (53), each latching member 21 pushes against a corresponding first locking leg 51 forcing locking members 50 to move linearly closer to each other against the bias of elastic members 30, respectively.

[0029] Locking members 50 are disposed away from each other (having moved under the bias of respective elastic members 30) when each latching member 21 is fully inserted into its respective insertion space (53) formed on each side by first locking leg 51 and second locking leg 52, respectively. Full insertion may be defined as inner surface 51a of first locking leg 51 having engaged inner surface 21a of latching member 21 on each side, which results in battery cover 20 being locked securely to main body 10, as generally illustrated in Fig. 4. A person skilled in the art would immediately

appreciate that spring loading locking members 50 in the manner described hereinabove and shown in the drawings helps prevent the accidental release of a locked battery cover 20 from main body 10.

[0030] The process of unlocking battery cover 20 from main telephone body 10 is generally depicted in reference to Figs. 6A – 6B. Specifically, the user grips knobs 40 (not shown) and forces locking members 50 to move linearly closer to each other against the bias of elastic members 30 to allow disengagement of inner surface 21a of latching member 21 from inner surface 51a of first locking leg 51, respectively, on each side. As each latching member (21) gradually moves out of its respective insertion space 53, inner surface 52a of second locking leg 52 pushes against outer surface 21b of its respective latching member 21 with latching member 21 sliding along inclined inner surface 52a, as generally shown in Figs. 6A – 6B, unlocking battery cover 20 from main body 10.

[0031] Figure 7 schematically illustrates an alternative locking mechanism in accordance with another preferred embodiment of the present invention. The locking mechanism may be used to securely lock a battery cover to the main body of a mobile telephone set, as generally shown in reference to Fig. 7. The battery cover locking mechanism of Fig. 7 preferably comprises a pair of oppositely disposed generally hook-shaped latching members 21 formed on battery cover 20, and a pair of locking members 150 movably disposed opposite each other within main telephone body 10 and adapted to engage latching members 21 to secure battery cover 20 to main body 10. The battery



cover locking mechanism of Fig. 7 also comprises a pair of oppositely disposed elastic members 130, each one operatively coupled between a corresponding locking member 150 and a support member 112 which is formed in the middle of a groove 111, as generally shown in Fig. 7. Groove 111 is disposed in main body 10 and used to guide the linear movement of locking members 150. Support member 112 is used to support elastic members 130.

[0032] Each locking member (150) includes a pair of generally oppositely disposed first and second locking legs 151, 152 adapted to form an insertion space 153 for latching member 21. First and second locking legs 151, 152 are preferably adapted to engage a corresponding latching member 21 within its respective insertion space 153 to securely lock battery cover 20 to main body 10. Specifically, an inner surface 151a of first locking leg 151 is adapted to engage a corresponding inner surface 21a of latching member 21 to catch the same within insertion space 153, as generally illustrated in Fig. 7.

[0033] Second locking leg 152 includes an inner surface 152a, which is inclined at a predetermined angle so as to generally match the curvature of a corresponding outer surface 21b of latching member 21. When latching member 21 is in the process of being released from the grip of first and second locking legs 151, 152, second locking leg 152 pushes latching member 21 out of insertion space 153. Outer surface 21b of latching member 21 is adapted to allow latching member 21 generally smooth entry into insertion space 153 with outer surface 21b pushing against inner surface 152a of second locking leg 152 when battery cover 20 is being locked to main body 10.

[0034] Each elastic member 130 may be in the form of a spring coupled between a corresponding locking member 150 and support member 112 with the springs being disposed opposite each other and each spring being biased toward a corresponding latching member (21). Alternatively, a single elastic member 130 in the form of a spring may be used to spring load just one or both locking members 150 in the manner described hereinabove. Other spring loading configurations may be utilized provided such other configurations do not depart from the intended purpose of the present invention.

[0035] The battery cover locking mechanism of Fig. 7 further comprises a locking member moving apparatus (LMMA) 200 which may be utilized to move locking members 150 toward/away from each other. LMMA 200 includes a connection link 160 integrally extending from one of the locking members (150), a knob 140 protruding from connection link 160, a pair of oppositely disposed rack gears 170 with each rack gear extending from a respective locking member (150), and a pinion gear 180 rotatably disposed in guiding groove 111 and adapted to mesh with rack gears 170.

[0036] Knob 140 is adapted to protrude through an aperture 90 formed in a locking mechanism cover 80, as generally shown in Fig. 8. Knob 140 is adapted for gripping by the user. The user moves connection link 160 linearly via knob 140 to unlock battery cover 20 from main telephone body 10.

[0037] The process of locking battery cover 20 to main telephone body 10 is generally depicted in reference to Figs. 9A – 9B. Specifically, as each latching member (21) of battery cover 20 gradually enters its respective

insertion space (153), each latching member 21 pushes against a corresponding first locking leg 151 forcing locking members 150 to move linearly closer to each other against the bias of elastic members 130, respectively.

[0038] Locking members 150 are disposed away from each other (having moved under the bias of respective elastic members 130) when each latching member 21 is fully inserted into its respective insertion space (153) formed on each side by first locking leg 151 and second locking leg 152, respectively. Full insertion may be defined as inner surface 151a of first locking leg 151 having engaged inner surface 21a of latching member 21 on each side, which results in battery cover 20 being locked securely to main body 10, as generally illustrated in Fig. 7. A person skilled in the art would undoubtedly appreciate that spring loading locking members 150 in the manner described hereinabove and shown in the drawings helps prevent the accidental release of a locked battery cover 20 from main body 10.

[0039] The process of unlocking battery cover 20 from main telephone body 10 is generally depicted in reference to Figs. 10A – 10B. Specifically, the user moves knob 140 generally to the right of central axis 139 (Fig. 8) which forces locking members 150 to move linearly closer to each other against the bias of elastic members 130 by rack-and-pinion action to allow disengagement of inner surface 21a of latching member 21 from inner surface 151a of first locking leg 151, respectively, on each side. Moving knob 140 results in a corresponding linear translation of the locking member having the

integral connection link (160) which in turn causes a respective rack-and-pinion translation of the other locking member (150) which is not coupled to knob 140.

[0040] As each latching member (21) gradually moves out of its respective insertion space 153, inner surface 152a of second locking leg 152 pushes against outer surface 21b of its respective latching member 21 with latching member 21 sliding along inclined inner surface 152a, as generally shown in Figs. 10A – 10B, unlocking battery cover 20 from main body 10.

[0041] A person skilled in the art would recognize that the above-described novel locking mechanism is not restricted to mobile telephone battery cover locking applications, but may be easily implemented in various other locking applications. Other components and/or configurations may be utilized in the above-described embodiments. For example, the latching and locking members, described hereinabove and shown in the accompanying drawings, may be configured in many other ways, provided such other configurations reside within the scope of the present invention.

[0042] Moreover, all terms should be interpreted in the broadest possible manner consistent with the context. In particular, the terms "comprises" and "comprising" should be interpreted as referring to elements, components, or steps in a non-exclusive manner, indicating that the referenced elements, components, or steps may be present, or utilized, or combined with other elements, components, or steps that are not expressly referenced.

[0043] While the present invention has been described in detail with regards to several embodiments, it should be appreciated that various

modifications and variations may be made in the present invention without departing from the scope or spirit of the invention. In this regard it is important to note that practicing the invention is not limited to the applications described hereinabove.

[0044] Many other applications and/or alterations may be utilized provided that such other applications and/or alterations do not depart from the intended purpose of the present invention. Also, features illustrated or described as part of one embodiment can be used in another embodiment to provide yet another embodiment such that the features are not limited to the embodiments described above. Thus, it is intended that the present invention cover all such embodiments and variations as long as such embodiments and variations come within the scope of the appended claims and their equivalents.